WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

TM-111310-G1

VOLUME 1 - OPERATOR'S MANUAL

COMMUNICATION INTERFACE
OPTION 105
FOR THE SERIES 808
ELECTRIC POWER/DEMAND ANALYZER

1 May 1985

Note: Refer to Volume 2 (Service Manual) TM-111310-G1 for maintenance information.

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VOLUME 1
OPERATOR'S MANUAL

SERIES 808 COMMUNICATION INTERFACE
OPTION 105

SECTION I
GENERAL INFORMATION

1.1 SCOPE

This manual consists of two volumes. Volume 1, the Operator's manual, is divided into two sections: I) GENERAL INFORMATION, and II) INSTALLATION AND OPERATION. Volume 2, the Service manual, contains the maintenance instructions and consists of four sections, IV through VII (see Volume 2 for a description of these sections).

1.2 INTRODUCTION

This manual contains the operating instructions for the Communication Interface Option 105 PC Board, referred to as the Option 105. Option 105 is intended for use with the Series 808 Electric Power/Demand Analyzer, referred to as either the Series 808 or 808 unit. The instructions in this manual assume that the reader is already familiar with the operation and use of the 808 unit as described in Volume 1 of TM-110300 (Series 808 Operator's manual).

1.3 PURPOSE

Option 105 provides the 808 unit with a communication link for both remote operation and continuous data output. Communication is established by using the Option's RS-232C port. The RS-232C port is intended for data communication to another 808 unit, terminal, teletype, or computer, at distances of less than 50 feet (15 meters). Should the communication link be interrupted, Option 105 contains a built-in 8000 character data buffer. The data buffer will retain up to 8000 characters of data until the communication link is re-established.

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1.4 APPLICATIONS

Option 105 provides a communication interface which is necessary for monitoring data in an energy survey.

Using Option 105 for Remote Operation of the 808 Unit
Option 105 may be used for remote operation of the 808 unit. In general, this allows the user to print or display, by way of the RS-232C port, the remote Series 808 output on a peripheral device: a printer, CRT (cathode ray tube), computer, or another 808 unit.

Using Option 105 for Inputting Data to the 808 Unit
Another operational mode of Option 105 provides the 808 unit with a means of accepting direct data entry through its RS-232C port. This is very useful in terms of computer analysis of energy data, or, using the 808 unit as an intelligent power transducer for both energy management and power monitoring systems.

Using Option 105 for Interrogating Remote 808 Units
Finally, Option 105 allows the user to interrogate a collection of remote 808 units with the host 808 unit or terminal. This allows multiple placements of 808 units for monitoring remote buildings, machinery, and operations.

1.5 TECHNICAL CHARACTERISTICS

The technical specifications of the Option 105 Communication Interface are listed in table 1-1.

Table 1-1. Option 105 Technical Specifications (page 1 of 3)

I. HARDWARE FEATURES

A. RS-232C Interface
1) Full Duplex Operation
2) Three Selectable Baud Rates: 300, 1200, or 9600
3) Configured as DTE (Data Terminal Equipment)

B. Data Buffer
1) 8000 Character Storage Buffer
2) Internally Compressed Format
for Maximum Data Storage
3) Data Maintained During Power Loss
by a Battery Backup

C. Communication Port and Baud Rate

1) Selected by the Rear Panel Switches: S1 and S2

(continued)

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Table 1-1. Option 105 Technical Specifications (page 2 of 3)

II. CONNECTORS

A. RS-232C Connector
1) 25-Pin Male Connector, Type DB25-P
2) Lines Supported:

Pin Number	Circuit	Definition
1	AA	Protective Ground
2	BA	Transmitted Data
3	BB	Received Data
4	CA	Request to Send
5	CB	Clear to Send
6	CC	Data Set Ready
7	AB	Signal Ground
8	CF	Received Line Signal Detector
20	CD	Data Terminal Ready

III. SWITCHES S1, S2 AND PROGRAMMING PLUG (PN 111607)

A. Switch Positions (Under Hole Plug on Rear Panel):

S1	S2	Plug	Baud Rate	Data Channel
OFF	OFF	----	300	RS-232
ON	OFF	----	1200	RS-232
OFF	ON	----	9600	RS-232

IV. DATA FORMAT

A. Seven Bit Serial ASCII with Even Parity (Eight Bits Total)

V. VOLTAGE LEVEL OUTPUTS

A. RS-232C Outputs
1) Data Space or Control Line True: +12V Nominal
2) Data Mark or Control Line False: -12V Nominal

B. RS-232C Inputs
1) Data Space or Control Line True: < +3V
2) Data Mark or Control Line False: > -3V

(continued)

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Table 1-1. Option 105 Technical Specifications (page 3 of 3)

VI. RS-232 CIRCUIT DESCRIPTIONS

2 - XMIT DATA (BA): Serial data output from the 808 unit. Controlled by CTS, DCD, or DSR lines (see notes 1 and 2).

4 - RTS (CA): Request to Send. Logical true whenever the 808 unit is able to receive data. False when either the 63-character buffer is full, or a break has been recognized (see note 3).

20 - DTR (CD): Data Terminal Ready. True whenever the 808 unit is able to receive data. Goes false when a break is recognized (see note 3).

3 - REC DATA (BB): Serial data input to the 808 unit. Affected by RTS, DCD, and DSR lines (see notes 1, 2, and 3).

5 - CTS (CB): Clear to Send. If true, the 808 unit will send data. If false, the 808 unit will hold the data to be transmitted until the signal is returned true.

8 - DCD (CF): Data Carrier Detect. When true, the 808 unit is enabled both to send and receive. When false, the 808 unit will ignore input data and hold back any output data.

6 - DSR (CC): Data Set Ready. When true, signals that the communication path to the 808 unit has been established. When false, signals the 808 unit that the path is disconnected. The 808 unit will abort any communication operations in progress if this line goes false.

Note 1: All data is 7-bit serial ASCII, with even polarity.

Note 2: The 808 unit will accept all ASCII characters including SPACE, DELETE, Nul, DC1, DC2, RETURN, and ESC. All other control characters are ignored. DC3 (^S) will cause output data to pause; DC1 (^Q) will resume the data output.

Note 3: A BREAK condition is caused either by a continuous space level on line BB, or after after receiving 32 consecutive null characters. Once recognized, the Series 808 sets DTR and RTS to false. DTR and RTS will remain false until DSR also goes false. If DSR is not used, a lock-up condition will be caused by a break. To prevent this lock-up, tie the DSR line to DTR.

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SECTION II
INSTALLATION AND OPERATION

2.1 GENERAL

This section contains the installation and operation procedures for the Option 105.

2.2 INSTALLATION OF THE COMMUNICATION INTERFACE

To install the communication interface to the Option 105 PC Board, proceed as follows:

1) Turn OFF the 808 unit.

2) Remove the hole plug from the top of the rear panel of the 808 unit (next to the RJ11 jack). Set the switches of S1 and S2 to the desired positions (refer to table 1-1, Roman numeral III, for the baud rates of the switch positions). Replace the hole plug.

3) Hook up an RS-232C cable from the user's data equipment to connector J5 of Option 105.

4) Connect the analog or pulse signal inputs to the 808 unit.

5) Turn ON the 808 unit.

2.3 RS-232 CONNECTION

EIA Standard RS-232C, recommends that the RS-232 cables be no longer than 50 feet (15 meters). Whenever Option 105 is used to interface the 808 unit with another RS-232 port which does not support line CC (DSR, pin 6 of J5), line CD (DTR, pin 20 of J5) should be tied to line CC. Figure 2-1 illustrates some typical RS-232 wiring connection examples for the Option 105.

CAUTION

In general, Option 105 should NOT be operated in an electrically "noisy" environment. Should the requirement arise to use the RS-232 port in such an environment, a shielded cable should always be used.

2.3.1 Shielded Cable use with an RS-232 Connection

If a shielded cable must be used, tie the shield to the AA circuit, pin 1 of the 25-pin connector J5. The specific type of mating connector for this port is a DB25-S (female).

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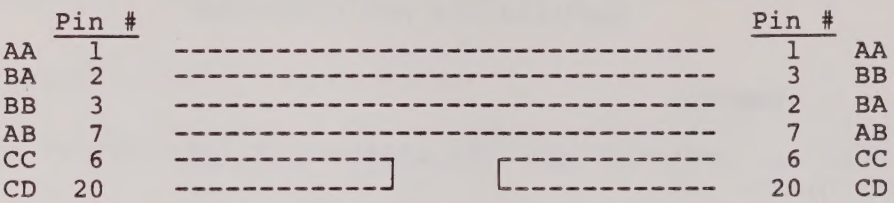
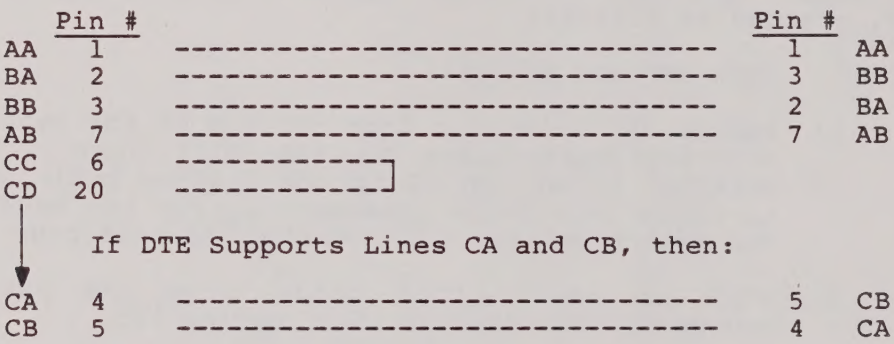
1) Local Series 808 J5 TO Remote Series 808 J5



2) Series 808 J5 (DTE) TO Data Terminal Equip. (Terminal,Printer,Etc.)



3) Series 808 J5 (DTE) TO Data Communication Equip. (Computer, Etc.)

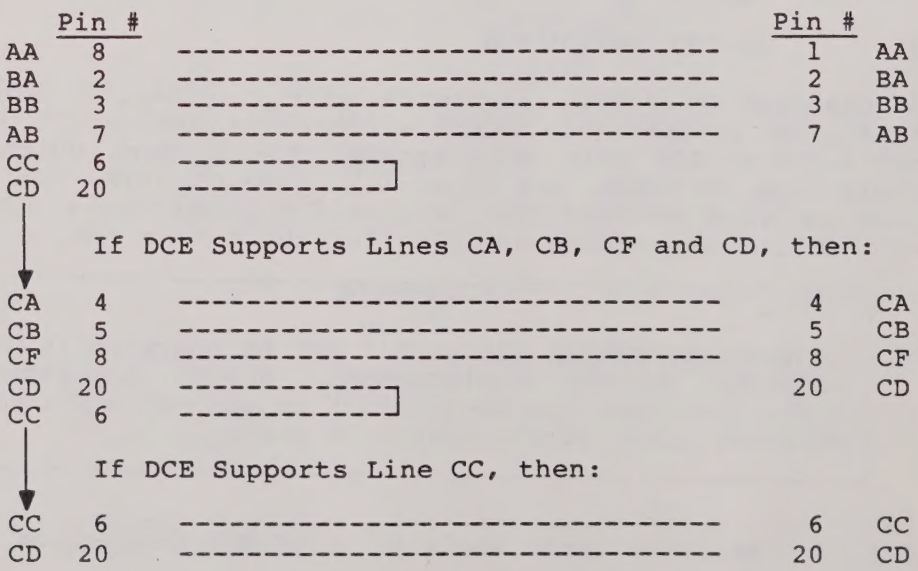


Figure 2-1. Examples of Typical RS-232 Connections

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2.4 OPERATING A REMOTE 808 UNIT

The following subsections contain the instructions on how to use a remote Series 808 and the unit's REMOTE FUNCTIONs. Included are differences between using a remote 808 with another Series 808 or other data terminal equipment, the REMOTE FUNCTIONs of Option 105, and a description of the different output modes.

2.4.1 Communication Interface

Operation of a remote 808 unit with a local 808 unit is very similar to the standard Series 808 operation described in Operator's manual TM-110300, with the addition of the REMOTE FUNCTIONs (see subsection 2.4.2). The user's local 808 unit will operate as if it were the front panel of the remote 808 unit; all keys which are pressed on the local unit will be accepted by the remote unit. In addition, the local unit will also display or print whatever the remote unit displays or prints. All key sequences entered at the local unit will program the remote unit.

In order to operate the remote unit with other data terminal equipment, the user must use the abbreviations in table 2-1. The abbreviations emulate the actual Series 808 keys.

Note: These are the same abbreviations that Option 105 sends through its communication link when an 808 unit is used to operate another 808 unit.

For example: The following commands would set the remote 808 unit's voltage k-factor to a value of 2.3 (this is with the local prompts on). The keystrokes entered by the user are in response to the Series 808 prompt directly to their left.

The Series 808 Responds	Operator Enters*
	[ESC] or [\]
[Mode]	[S][E]
[YFun]	[R][F]
[RFun]	[K][F]
[Unit] Kfact	[V][O]
[Valu] KFact V	[2]
[Valu] Kfact V 2	[.]
[Valu] Kfact V 2.	[3]
[Valu] Kfact V 2.3	[ENTER]**

* -Under the "Operator Enters" column, the letters enclosed within the brackets "[]" represent the keys on a remote terminal. For example: [S] [E] [ESC] indicates that the "S" "E", and escape keys should be pressed.

** -[ENTER] may be substituted with [T][O] or [E][N] (see table 2-1).

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Table 2-1. Series 808 Keyboard Abbreviations (page 1 of 2)

Prompt	808 key	Abbreviations
None	CLEAR/ENABLE	[\] or [ESC]*
[Mode]	READ	[R][E] or [R][D]
	PRINT	[P][R]
	SET	[S][E]
[YFun]	RED FUNCTION	[R][F]
	STATUS	[S][T]
	VALUE	[V][L]
	TIME	[T][I] or [T][M]
	DATE	[D][T]
	SUMMARY	[S][M]
	DEMAND ACCUM	[D][A]
	DEMAND PROJECT	[D][P]
	ENERGY RATE	[E][R]
	REMOTE FUNCTION	[R][M]
[RFun]	ALARM	[A][L]
	LOCK	[L][K]
	k FACTOR	[K][F]
	BILLING DATES	[B][D]
	SETUP DATA	[S][U]
	DEMAND LIMIT	[D][L]
	INTERVAL SYNC	[I][S]
	DEMAND INTERVAL	[D][I]

(continued)

Note: The PRINT HOLD and STANDBY functions are NOT available from a remote terminal.

* -Letters enclosed within brackets "[]" represent the required keys to be pressed, i.e., [P][R] means press "P" and then "R".

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Table 2-1. Series 808 Keyboard Abbreviations (page 2 of 2)

Prompt	808 key	Abbreviations
[Unit]	VOLTS	[V][O]
	AMPS	[A][M]
	WATTS	[W][A] or [W][T]
	V.A.	[V][A]
	P.F.	[P][F]
	V.A.R.	[V][R]
[Misc]	CHAN A	[C][A]
	CHAN B	[C][B]
	CHAN C	[C][C]
	ON/YES	[O][N] or [Y][S]
	OFF/NO	[O][F] or [N][O]
	TOTAL/ENTER	[T][O] or [E][N] or [ENTER] *
[Value]	0,1,2,3,4, 5,6,7,8,9, or .	[0],[1],[2],[3],[4], [5],[6],[7],[8],[9], [.]

* -[ENTER] represents an ASCII carriage return.

Note: Option 105 will send the following prompts to any equipment when required. (Local prompts are set ON or OFF; Remote Function 40).

Prompt LED	Display
MODE	[Mode]
YELLOW FUNCTION	[YFun]
RED FUNCTION	[RFun]
UNIT	[Unit]
VALUE	[Value]
MISC	[Misc]

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2.4.2 Option 105 REMOTE FUNCTIONs

Table 2-2 on the following page is a list of REMOTE FUNCTIONs provided when the Series 808 is equipped with Option 105. The key sequence to depress when selecting a REMOTE FUNCTION is:

(1) (2) (3) (4) (5) (6)

[CLEAR] [SET] [REMOTE FUNCTION]* [#]** [#] [ENTER]

* -The "REMOTE FUNCTION" key on some of the older Series 808 front panels is not labelled. If it is not labelled on your particular unit, it is the key next to the [CLEAR ENABLE] key (fourth row, second column on the 4-by-7 key pad matrix).

** -Where: [#] [#] represents the required two (or in some cases one) digit numeric entry.

When using a peripheral device other than an 808 unit, REMOTE FUNCTIONs are set by depressing:

(1) (2) (3)

[\] or [ESC], followed by the numeric entry [#] [#].

For example:

1) To turn the remote 808 printer OFF, using a local 808 unit, the required key sequence would be:

(1) (2) (3) (4) (5) (6)

[CLEAR] [SET] [REMOTE FUNCTION] [4] [5] [ENTER]

2) To turn the remote 808 printer OFF, using a peripheral device such as a terminal, rather than a local 808 unit, the required key sequence would be:

(1) (2) (3)

[\] or [ESC] [4] [5]

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Table 2-2. REMOTE FUNCTIONs

Function Number	Function	Reference Subsection
0	Local 808 unit exits front panel mode.	2.4.2.1
1	Local 808 unit enters front panel mode.	2.4.2.1
2	Not Used.	
3	Not Used.	
40	Toggles the local equipment prompts OFF and ON.	2.4.2.2
41	Clears data in the Series 808 character buffer.	2.4.2.3
42	Holds all automatic printout data in the character buffer.	
43	Sends all of the data in the buffer out the Series 808 communication port.	2.4.2.3
44	Sets the remote 808 printer OFF.	
45	Sets the remote 808 printer ON.	
46	Toggles local repeat read function ON and OFF.	2.4.2.2
47	Sets the Series 808's output into the raw data mode.	2.4.2.4
48	The 808 unit's output exits the raw data mode.	2.4.2.4
49	Non-destructive buffer (memory test).	
5	Not Used.	
7	Not Used.	
80	Synchronous data output for raw data mode.	2.4.2.4
81	Enter the remote 808's 6-digit ID number.	
82	Send the remote 808's ID number to the local equipment.	
83	Toggle the remote unit's raw data summation.	2.4.2.4
84	Reset the raw data summation to zero.	2.4.2.4
85	Send the number of buffer characters used.	2.4.2.3
9	Not Used.	

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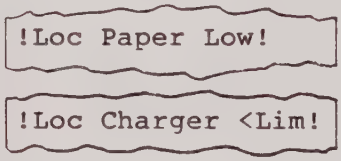
2.4.2.1 The Front Panel Mode

An 808 unit with Option 105 may be used to operate another remote 808 through the "Front Panel" mode.

If REMOTE FUNCTION "1" is selected, the local 808 will begin to behave as the remote unit.

> Note: To exit this mode at any time, select REMOTE FUNCTION "0".

In this mode, the local unit will continue to make its own measurements and maintain its data summary. In general, all automatic printouts of the local unit are disabled. The exceptions to this, however, occur when the local unit is low on printer paper or loses power for its battery charger. The local printer will print the respective messages for these two exceptions:



When the printer paper is low, the "Paper Low" message will occur every 64 lines of print. The "Charger" message is printed once with continuous alarm activation. Should the local unit go into the standby mode when it is already in the "Front Panel" mode, the unit will return from "Standby" in the "Front Panel" mode.

Notes

1) The remote unit must NOT be in the "Power-On" prompting mode prior to connecting it to the local unit. The minimum turn-on procedure for the remote 808 unit is as follows:

   a) Install the unit and turn ON the Power-On key.

   b) Press [CLEAR] once to exit the prompting mode.

   c) Turn the local 808 unit ON, and select REMOTE FUNCTION "1". This procedure will prevent any possible lock-up of the unit.

2) After setting the local unit into the "Front Panel" mode (with REMOTE FUNCTION "1"), wait until the display goes blank before attempting any key sequences.

3) When using Option 105 at 300 baud, the response to any keystrokes is slower than at normal operation speed. Always wait for the LEDs and display prompts before pressing any more keys.

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2.4.2.2 Prompt and Repeat Toggle Functions

When Option 105 is used with other equipment such as a terminal, it will send prompts in brackets "[]". The full set of prompts reflect the LED prompts of the Series 808 front panel and are listed is table 2-1. Use of REMOTE FUNCTION "40" will toggle these prompts Off.

For example: To print out the total watts:

The Series 808 Responds	Operator Enters*
	[ESC] or [\]
[Mode]	[P][R]
[YFun]	[V][L]
[Unit]	[W][T]
[Misc] Chan A,B,C or T?	[T][O]

The printout would read something like: "T 7.238KW" (assuming that 7.238 kilowatts was the value).

Note: Use of [\] [4] [0] would turn the prompts OFF; the above example would become a sequence of keystrokes such as the following:

[\] [P] [R] [V] [L] [W] [T] [T] [O]

The resulting printout would be as such as the following :

"T 7.238KW" (assuming 7.238 kW as the value)

Note: There is no return and line feed on the display. If you require the "Prompt" mode again, use [\] [4] [0] to toggle the prompts back ON.

Another toggle function of Option 105 is the repeat read function, REMOTE FUNCTION "46". This function, when ON, will send the data being displayed on the remote 808 unit to the local equipment; Option 105 will continue to send the data until REMOTE FUNCTION "46" is toggled OFF. In this way, it is possible to obtain a continuous update on voltage readings, accumulated demand, or any other display of the Series 808.

Note: These two REMOTE FUNCTIONS, "40" and "46", are NOT intended for use in the "Front Panel" mode between two 808 units.

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2.4.2.3 Character Buffer

The character buffer of Option 105 provides storage for all automatic printouts of the remote 808 unit. There are several REMOTE FUNCTIONs which may be used to control the buffer.

The buffer may be initialized or reset with REMOTE FUNCTION "41". The buffer will be completely cleared and ready for use. When ready, you may re-enable the buffer for storage with REMOTE FUNCTION "42". All data will then be stored in the buffer. You may also, at any time, determine how full the remote buffer is by selecting REMOTE FUNCTION "85". This function will send a total count of how many characters out of the possible 8000 have been used. Should you require that the data be sent, REMOTE FUNCTION "43" will cause Option 105 to dump the buffer to the local equipment. Upon completion of the buffer dump, Option 105 will confirm the dump by sending the "Buffer Done" message.

> Note: Care should be taken with REMOTE FUNCTION "43", since the dump will clear the buffer and disable the storage mode of the buffer. Further buffer storage would then require the use of REMOTE FUNCTION "42".

If the amount of data to be stored exceeds the 8000-character limit, an overflow condition will occur. If user action is not taken at this time, all subsequent data will be lost. In the overflow condition, all PRINT requests are ignored and any MODE operation of the remote 808 will be followed by the message "Buffer Full". The overflow will also cause a flag (marker) to be put in the buffer at the time of the occurrence. When the data is dumped, the data will contain the message "Overflow" at the point where it occurred.

Character Buffer Special Features

There are some special features of the character buffer that are not controlled by the REMOTE FUNCTIONs. The buffer may also become enabled whenever the communication link to the remote 808 unit is interrupted. The buffer dump, REMOTE FUNCTION "43", may be stopped at any time with either the [CLEAR], [\], or [ESC] key of the 808 unit. Termination of the dump will occur when Option 105 recognizes and echoes the key. Subsequent buffer dumps will start at the beginning of the last line sent. All characters sent previous to the termination are made available to the buffer for new data. The buffer will also respond to ^S and ^Q inputs (control S and Q), providing Pause/Continue functions and making possible the viewing of up to 14 feet of printer data.

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2.4.2.4 Raw Data Mode

The "Raw Data" Mode allows the remote 808 to become a transducer for power measurement and managing systems. When selected by REMOTE FUNCTION "47", Option 105 will send the raw Series 808 data. This data consists of the volts, amps, watts, and VARs for each of the three channels. Also selectable in this mode by toggling REMOTE FUNCTION "83", is a running summation of VARH and WH. REMOTE FUNCTION "84" is used to reset or clear these summations to zero. The data is sent in a compressed ASCII data format to minimize transfer time when needed. This compressed format is provided with a check-sum for validity, and can easily be decoded by any computer.

Note: The Raw Data Mode forces three-channel output.

String Format:

"$" identifies the beginning of a raw data string.
N1,N2 Data character count, 2 hexadecimal digits.

D1-D60 Data Characters, as follows:

Chan A	D1-D5	Volts
	D6-D10	Amps
	D11-D15	Watts
	D16-D20	Vars
Chan B	D21-D25	Volts
	D26-D30	Amps
	D31-D35	Watts
	D36-D40	Vars
Chan C	D41-D45	Volts
	D46-D50	Amps
	D51-D55	Watts
	D56-D60	Vars
	D61-D65	Varh
	D66-D70	Wh
	C1,C2	Check-sum characters, 2 hexadecimal digits provide the binary sum of N1, N2, D1-D60 (D-D70 characters).

Data Format:

D1 positive mantissa = "0,1,2,3,4,5,6,7,8,9"
D1 negative mantissa = "p,q,r,s,t,u,v,w,x,y" (bit 6 set = neg. number)

Note: Assumed decimal point is between D1 and D2.

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Data Format Continued:

D2 to D4 fractional portion of mantissa, "0 to 9".

D5 positive exponent = "E+00 to E+14" (Hex $30 to $3E)
D5 negative exponent = "E-01 to E-14" (Hex $70 to $7E)
Note: p=-0 is the overflow condition.

Some examples:

12345 = +1.234 E+05	q234u = -1.234 E-05
6789s = =6.789 E-05	s6789 = -3.678 E+09
9999p = >9.999 E+14	y999p = <-9.999 E+14

Date Rate:

One full string every 1.5 seconds (1200 and 9600 baud).
At 300 baud, the rate is one full string every 3 seconds.

Data Synchronization:

To synchronize the raw data stream of more than one 808 unit, send [\] [8] [0] or the single character [!] to each unit.

Note: If [\] [8] [0] is received during the raw data transmission, data synchronization does not occur until the transmission is completed. Data Synchronization begins unconditionally at the time when the [!] character is received. Synchronization time is approximately 2 seconds when using [!].

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Data Synchronization Continued:

For example: The below string is typical for raw data output without the summation.

$3C47732714303002316153477327152030073161634775271490300631617384

Note: "$" begins the string.

3C N1,N2 3C=60 decimal characters sent.

47732	D1-D5		4.773 x 10E+02 V
71430	D6-D10		7.143 x 10E+00 A
30023	D11-D15	Channel A	3.002 x 10E+03 W
16153	D16-D20		1.6153 x 10E+03 VAR
47732	D21-D25		4.773 x 10E+02 V
71520	D26-D30		7.152 x 10E+00 A
30073	D31-D35	Channel B	3.007 x 10E+03 W
16163	D36-D40		1.616 x 10E+03 VAR
47752	D41-D45		4.775 x 10E+02 V
71490	D46-D50		7.149 x 10E+00 A
30063	D51-D55	Channel C	3.006 x 10E+03 W
16173	D56-D60		1.617 x 10E+03 VAR

84 C1C2 C1C2 = ASCII (N1,N2,D1-D60)

2.5 FACTORY REPAIR

When factory repair is required, proceed as follows:

1) Contact the Dranetz Service Corporation (formerly Dranetz Technologies, Inc. Customer Service Department) in order to obtain an authorization number.

   Tel: (201) 287-2535; TWX: (710) 997-9553;

   Telex: 499-7808; Cable: DRANETZ

2) Fill out the REPAIR/SERVICE ORDER form enclosed in the Volume 1 Series 808 manual and ship it, along with the equipment, to the Dranetz Service Corporation.

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WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

TM-111310-G3

VOLUME 1

OPERATOR'S MANUAL

COMMUNICATION INTERFACE

OPTION 106 FOR

SERIES 808 ANALYZER

1 May 1984
(Revised 15 September 1984, 1 May 1985)

NOTE

Refer to Volume 2 (Service Manual) of TM-111310-G3 for maintenance data.

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DRANETZ
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SERIES 808 COMMUNICATION INTERFACE OPTION 106

1 INTRODUCTION

This manual provides the instructions for the Communication Interface Option 106, hereinafter referred to as Option 106. Option 106 is intended for use with the Series 808 Electric Power/Demand Analyzer. The reader should be familiar with the use and operation of the 808 described in Volume 1 of 808 manual TM-110300 when attempting to use Option 106.

2 PURPOSE

Option 106 provides the 808 unit with a communication link for both remote operation and for continuous data output. Communication can either be established by using the Option's RS-232C port or modem. The RS232C port is intended for data communication at distances less than 50 feet to another 808, a terminal, a teletype, or a computer. The modem has been provided for remote operation of the 808 unit and may be connected to the public phone line. In either case, should the communication link be interrupted, Option 106 has an 8000 character data buffer to retain data until the link is reestablished.

The modem of Option 106 has two modes of operation. The dedicated mode provides the user with the means of using a dedicated phone line. The other mode of operation provides auto answer and dial features to the user with the addition of direct connection to the public phone lines. These two modes are selected by use of the factory supplied program plug.

3 APPLICATIONS

Option 106 provides the communication interface necessary for monitoring data for an energy survey or remote operations of the 808 unit. In general, this allows the user to print or display the 808 output on some other device, be it another 808, printer, CRT, or computer. Other modes of the Option 106 provide the 808 unit with the means to provide direct data entry from its output. This is very useful in terms of computer analysis of the energy data or using the 808 as an intelligent power transducer for energy management and power monitoring systems. The option also enables the user to interrogate a collection of remote 808's with another 808 or a terminal. This allows multiple placements of 808 units monitoring remote buildings, machinery, and operations.

4 EQUIPMENT CHARACTERISTICS

Technical specifications of Option 106 are listed in Table 1.

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Table 1. Option 106 Specifications

I. Hardware Features

A. RS-232C Interface
1. Full duplex operation.
2. Supports most modem control lines.
3. 3 selectable baud rates (300, 1200, and 9600 baud).
4. Configured as DTE (Data Terminal Equipment).

B. Modem Interface for dedicated lines.
1. Full duplex, 300 baud, answer mode.
2. Bell 103 compatible.

C. Data Buffer
1. 8000 character storage.
2. Internal compressed format for maximum data storage.
3. Data maintained during power lost by battery backup.

D. Communication Port and Baud Rate
1. Selected by rear panel switches, S1 and S2.

II Connectors

A. RS232C Connector
1. 25 pin male, DB25-P
2. Lines supported.

A. Pin Number	Circuit	Definition
1	AA	Protective Ground
2	BA	Transmitted data
3	BB	Received data
4	CA	Request to send
5	CB	Clear to send
6	CC	Data set ready
7	AB	Signal ground
8	CF	Received line signal detector
20	CD	Data terminal ready

B. Modem Connector.
1. RJ11C modular phone jack.

III Switches S1, S2 and Programming Plug (PN 111607)

A. Switch positions (under hole plug)

S1	S2	Plug	Baud Rate	Data Channel
OFF	OFF	----	300	RS232
ON	OFF	----	1200	RS232
OFF	ON	----	9600	RS232
ON	ON	Removed	300	Dedicated Modem
ON	ON	Installed	300	Direct Connect Modem

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Table 1. Option 106 Specifications (Cont'd)

IV. Data Format
  A. Seven bit serial ASCII with EVEN parity, eight bits total.

V. Voltage Level Outputs

  A. RS232C Outputs.
    1. Data space or control line true +12V nominal.
    2. Data mark or control line false -12V nominal.

  B. RS232C Inputs.
    1. Data space or control line true < +3V.
    2. Data mark or control line false > -3V.

  C. Modem Transmit
    1. -9dBm into 600 ohm balanced lines.

  D. Modem Receive.
    1. Less than -42dBm to 12dBm, 600 ohm balanced load.

VI. Modem Frequencies

  A. Transmit FSK (Frequency Shift Keying)

Data	Answer Mode	Originate Mode
Mark	2225Hz	1270Hz
Space	2025Hz	1070Hz

  B. Receive FSK

Data	Answer Mode	Originate Mode
Mark	1270Hz	2225Hz
Space	1070Hz	2025Hz

  C. Answer - Originate Modes

    1. The remote 808 will always default to the Answer Mode.
    2. Whenever the 808 is used in the Front Panel Mode, the Modem automatically goes to Originate Mode.

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Table 1. Option 106 Specifications (Cont'd)

VII. Pulse Dialing and Auto-Answer Specifications

A. Pulse Dialing Specs.

1. Maximum Phone Number Length: Any combination of digits and pauses totaling 16.

2. Timing:

break time	60mSec
make time	40mSec
% break	60%
interdigit	740mSec
billing delay	2 Sec
cts delay	300mSec
optional pause	5 Sec

3. Dialing Sequence:

Start: Off hook, wait 2 sec.

Dial phone number (including pauses, if any) wait 2 sec.

Check for answer tone (2225 Hz). If tone not detected in 13 sec, hang up (on hook).

Answer tone detected, begin transmitting, originate tone (1270 Hz).
Wait 300 mSec (cts delay).

Enable transmission of data.
Enable redial.

Wait for continuous 13 sec less of carrier, 32 breaks (space) or null inputs or manual hang up command (function 60).

End: Hang up (on hook).

B. Auto Answer Specs*

1. A ring signal is defined as an AC voltage (typically 65 to 130 volts RMS at 30 Hz), with a DC component added, applied to the ring/tip conductors.

---

*See Appendix for special notes on Auto Answer Mode

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Table 1. Option 106 Specifications (Cont'd)

2. The 808 must detect two ring signals separated by an off period before beginning the auto answer sequence.

   Ring signal time: minimum 0.85 sec maximum 3.4 sec
   off period time: Minimum 1.7 sec maximum 6.8 sec

   Any ringing signal that does not fall within these limits will be ignored by the 808.

3. Auto answer sequence.

   Start: 2 rings detected, off hook, wait 2 sec.

   Begin transmitting answer tone (2225 Hz).

   Check for originate tone (1270 Hz).
   If tone is not detected in 13 sec, hang up (on hook).

   Answer tone detected, enable transmission of data.
   Enable redial.

   Wait for continuous 13 sec loss of carrier, 32 breaks (space) or null inputs or manual hang up command (function 60).

   End: Hang up (on hook).

VIII. RS232 Circuit Descriptions

2 XMIT DATA (BA): Serial data output from 808. Controlled by CTS, DCD or DSR lines (Notes 1 and 2).

4 RTS (CA): Request to send. Logical True when the 808 is able to receive data. False when either the 63 character input buffer is full, a break has been recognized (Note 3), or the modem is selected.

20 DTR (CD): Data terminal ready. True whenever the 808 is available for RS232 communication. Goes false when a break is recognized (Note 3), or the Modem is selected.

3 REC DATA (BB): Serial data input to the 808. Affected by RTS, DCD and DSR lines (Notes 1,2,3).

5 CTS (CB): Clear to send. If true, the 808 will send data. If false, the 808 will hold data to be transmitted until returned true.

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Table 1. Option 106 Specifications (Cont'd)

8 DCD (CF): Data carrier detect. When true, the 808 is enabled to both send and receive. When false, the 808 will ignore input data and hold back output data.

6 DSR (CC): Data set ready. When true, signals that communcation path is established to 808. When false, signals the 808 that the path is disconnected. The 808 will abort any communication operations in progress if this line goes false.

NOTE 1: All data is 7-bit serial ASCII, with even parity.

NOTE 2: The 808 will accept all ASCII characters from space thru delete, null, DC1, DC2, and return ESC. All other control characters are ignored. DC3 (^S) will cause output data to pause; DC1 (^Q) will resume data output.

NOTE 3: A BREAK condition is caused by a continuous space level on line BB or after receiving 32 consecutive null characters.

Once recognized, the 808 sets DTR and RTS to false. DTR and RTS will remain false until DSR also goes false. If DSR is not used, a lock-up condition will be caused by a break. To prevent lock-up, tie DSR to DTR.

---

5 INSTALLATION

5.1 Initial Hook-up Procedure

To install coommunication interface, proceed as follows:

a. Verify that the 808 unit is turned off.

b. Remove the hole plug from the rear panel and set the switches of S1 and S2 to the desired positions. Replace the hole plug.

c. If the RS232C port is to be used, hook up an RS-232C cable from the user data equipment to connector J5.

d. If the modem is to be used, plug the phone cable into connector J6 and then into the dedicated phone line.

e. Connect the analog or pulse signal inputs to the 808 unit and turn the unit on.

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5.2 RS232 Connection

EIA Standard RS-232C recommends that the RS232 cables be no more than 50 feet or 15 meters in length. For longer distances, or if the unit is in an electrically noisy environment, the built-in dedicated modem should be used. Should the requirement arise to use the RS232 port in such an environment, shielded cable should be used. Tie the shield to the AA circuit, pin 1 of the 25 pin connector J5. The specific type of mating connector for this port is a DB25-S (female).

Whenever Option 106 is used to interface the 808 unit to another RS232 port that does not support line CC (DSR, pin 6 of J5), line CD (DTR, pin 20 of J5) should be tied to line CC. Figure 1 shows some typical RS232 connection examples for the Option 106.

5.3 COMPLIANCE WITH FCC RULES AND REGULATIONS

The modem described in this manual has been approved by the Federal Communications Commission for direct connection to the Public Switched Telephone Network. To fully comply with FCC regulations, users must be aware of certain procedures and considerations regarding the actual installation and operation of registered terminal equipment.

5.3.1 Notification of the Telephone Company

Before connection to the telephone network, the telephone company must be told which particular line is to be used, the FCC Registration and Ringer Equivalence numbers of the modem, and which jack is required for the connection. The telephone company must be notified upon final disconnection of the equipment.

FCC REGISTRATION	# DRJ6YR-70738-DM-R
RINGER EQUA.	0.7B
JACK (USOC)	RJ11

5.3.2 Connection to the Telephone Network

All direct connection to the telephone network must be made through standard plugs and jacks as described in Part 68, Subpart F of the FCC Rules. Connection to party lines and coin telephone service is prohibited. After the telephone company is properly notified of the intended connection and the required jack is installed, the modem may be connected by inserting the mating plug of the cable into the jack.

5.3.3 Responsibilities of the Telephone Company

Technical information needed to permit compatibility with telephone company facilities shall be provided by the telephone company upon request. In order to afford the customer the opportunity to maintain uninterrupted service, the telephone company shall give adequate notice of changes in facilities and operations which could affect the use or performance of the customer's equipment.

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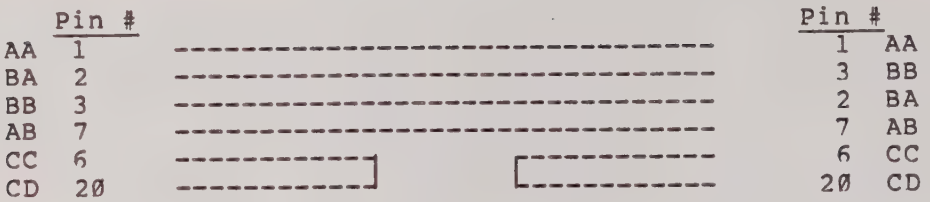
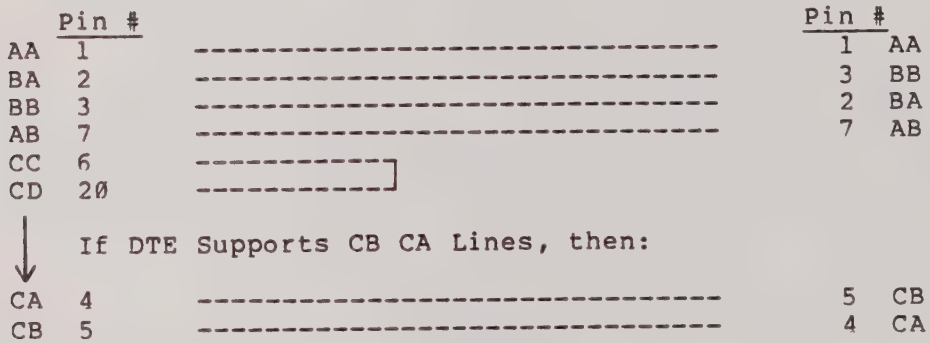
1. Local 808 J5 TO Remote 808 J5



2 808 (DTE) J5 TO Data Terminal Equipment (Terminal, Printer, Etc.)



3 808 (DTE) J5 TO Data Communication Equip. (Computer, Modem, Etc.)

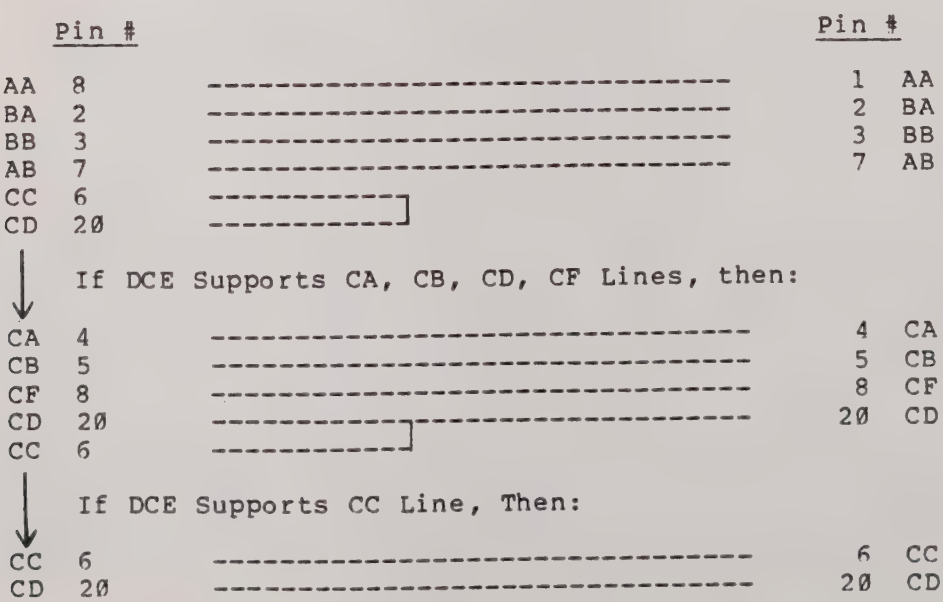


Figure 1. Examples of Typical RS232 Connections.

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5.3.4 In Case of Trouble

If trouble is experienced, the modem must be disconnected from the telephone line to determine if the equipment is malfunctioning. Use of the modem shall be discontinued until the problem is solved.

5.3.5 Incidence of Harm

If the modem should cause harm to the telephone network, the telephone company shall, if possible, notify the customer that service may be temporarily discontinued. If it becomes necessary to discontinue service immediately without prior notice, the telephone company shall promptly notify the customer, give the customer an opportunity to correct the harmful situation, and inform the customer of the right to bring a complaint to the Commission (FCC) pursuant to the procedures set forth in Part 68, Subpart E of the FCC Rules.

5.3.6 Labelling Requirements

A label shall be visible from the outside of the unit, listing the FCC registration number and ringer equivalence number of the registered modem.

5.3.7 Service

All service and repairs must be performed by Dranetz Technologies, Inc. or an authorized agent. If unauthorized modification or repair is performed, both the FCC registration and manufacturor's warranty in effect will be null and void. If a malfunction is suspected, it is the user's responsibility to contact Dranetz Technologies, Inc. or an authorized agent for instructions.

5.4 Modem Connection

Option 106 has a modem which may be programmed for dedicated use or connection to the public phone line. In either case, the user must first shut the 808 unit off after which switches S1 and S2 on the rear panel should be set in the "ON" position. If the user needs a dedicated modem, the program plug connected to J5 of the rear panel should be removed.* If a direct connect modem to a public line is required, the user should install the program plug (PN 111607) on J5. Plug the standard modular cord into J6 of the 808 rear panel and then the other plug into the line. Turn the 808 on.

Note: If the program plug is not available, turn the 808 on to the setup position before connecting the modem to the phone line and use REMOTE FUNCTION 64 (refer to para. 6.3.5), then connect the 808 modem to the phone line.

---

*CAUTION: Never connect to the Public Switched Network while using this mode.

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6 OPERATION

6.1 Introduction

The following paragraphs contain the information on how to use the remote 808 and the unit's remote functions. Included are the differences between using another 808 or other data terminal equipment, the "Remote Functions" of the Option 106 and a description of the different output modes.

6.2 Communication Interface

Operation of a remote 808 with another 808 is very similar to the standard 808 operation described in instruction manual TM-110300 with the addition of the REMOTE FUNCTIONS. The user's 808 unit will operate as if it were the front panel of the remote 808. All keys depressed on this unit will be accepted by the remote 808. In addition, the user's 808 will also display or print whatever the remote unit displays or prints. All key sequences entered at the local unit will program the remote. In order to operate the remote unit with other data terminal equipment, the user must use the abbreviations in Table 2. The abbreviations will operate the remote 808 just as if the 808 keys were depressed. Note that these are the same abbreviations Option 106 sends over the communication link when an 808 is used to operate another 808.

Example: The following would set the remote 808's voltage k-factor to 2.3. (This is with the local prompts on.)

808	OPERATOR
	"ESC" or "\"
[Mode]	SE
[YFUN]	RF
[RFUN]	KF
[Unit] Kfact	VO
[Valu] Kfact V	2
[Valu] Kfact V 2	.
[Valu] Kfact V 2.	3
[Valu] Kfact V 2.3	↵

Where ↵ is "EN" "TO" or ASCII CR (Return) - See Pg 12.

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Table 2. 808 Keyboard Abbreviations

Prompt	808 Key	Abbreviations
NONE	CLEAR/ENABLE	\ or Escape Key
[Mode]	READ	RE or RD
	PRINT	PR
	SET	SE
[YFun]	RED FUNCTION	RF
	STATUS	ST
	VALUE	VL
	TIME	TI or TM
	DATE	DT
	SUMMARY	SM
	DEMAND ACCUM	DA
	DEMAND PROJECT	DP
	ENERGY RATE	ER
	REMOTE FUNCTION	RM
[RFun]	ALARM	AL
	LOCK	LK
	K FACTOR	KF
	BILLING DATES	BD
	SETUP DATA	SU
	DEMAND LIMIT	DL
	INTERVAL SYNC	IS
	DEMAND INTERVAL	DI

NOTE: PRINT HOLD and STANDBY functions are not available from a remote terminal.

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Table 2. 808 Keyboard Abbreviations (Cont'd)

Prompt	808 Key	Abbreviation
[Unit]	VOLTS	VO
	AMPS	AM
	WATTS	WA or WT
	V.A.	VA
	P.F.	PF
	V.A.R.	VR
[Misc]	CHAN A	CA
	CHAN B	CB
	CHAN C	CC
	ON/YES	ON or YS
	OFF/NO	OF or NO
	TOTAL/ENTER	TO, EN or Return Key (ASCII CR)
[Value]	. 0,1.2,3,4,5, 6,7,8,9	. 0,1,2,3,4, 5,6,7,8,9

NOTE: Option 106 will send the following prompts to any equipment when required. (Local prompt are set on or off; Remote Function 40)

Prompt LED	Display
MODE	[Mode]
YELLOW FUNCTION	[YFun]
RED FUNCTION	[RFun]
UNIT	[Unit]
VALUE	[Value]
MISC	[Misc]

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6.3 REMOTE FUNCTIONS

Table 3 is a list of the REMOTE FUNCTIONS provided when the 808 is equipped with Option 106. The key sequence to depress is:

For other devices beside an 808, REMOTE FUNCTIONS are set by:

\ or Escape Key
##

In either case ## keys are either a one or two digit number depending upon the function.

Examples: To turn the remote 808 printer off:

1. The local 808 key sequence would be:

2. Equipment similar to a terminal would be:

\ 45

Table 3. Remote Functions

Function Number	Function	Reference Paragraph
0	Local 808 unit exits front panel mode.	6.3.1
1	Local 808 unit enters front panel mode.	6.3.1
2	Not used.	
3	Not used.	
40	Toggles local equipment prompts off and on	6.3.2
41	Clear all data in character buffer of the 808.	6.3.3

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Table 3. Remote Functions (Cont'd)

Function Number	Function	Reference Paragraph
42	Hold all automatic printout data in the character buffer.	6.3.3.
43	Send all the data in buffer out of the 808 communication port.	6.3.3
44	Set remote 808 printer on.	
45	Set remote 808 printer off.	
46	Toggle the local repeat read function on and off	6.3.2
47	Set 808's output into the raw data mode.	6.3.4
48	808 unit's output exits raw data mode.	6.3.4
49	Non-destructive buffer (memory) test.	
5	Not used.	
60	Disconnect phone line (go-on-hook)	
61	Dial previously entered phone (manual dial).	6.3.5
62	Enter phone number, up to 16 digits may be entered.	6.3.5
63	Enter Auto-Dial Times	6.3.5
64	Auto-answer mode on.	6.3.5
65	Auto-answer mode off	6.3.5
66	Dial on buffer full - ON.	6.3.5
67	Dial on buffer full - OFF.	6.3.5

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Table 3. Remote Functions (Cont'd)

Function Number	Function	Reference Paragraph
7	Not used.	
80	Sync data output for raw data mode.	6.3.4
81	Enter remote 808's 6 digit ID number.	
82	Send remote 808's ID number to local equipment.	
83	Toggle remote units raw data summation.	6.3.4
84	Reset raw data summation to zero.	6.3.4
85	Send number of buffer characters used.	6.3.3
9	Not used.	

6.3.1 Front Panel Mode

An 808 with Option 106 may be used to operate another remote 808 through the front panel mode. The operator uses the REMOTE FUNCTION 1, after which the local 808 will behave as the remote unit. To exit this mode at any time, the operator uses REMOTE FUNCTION 0. In this mode, the local unit will still be making its own measurements and maintaining the demand summary. In general all automatic printouts of the local unit are disabled. The exceptions to this occur when the local unit is low on printer paper or the local unit loses power for its battery charger. The local printer will print the respective messages for the exceptions:

```
!Loc Paper Low!
```

```
!Loc Charger <Lim!
```

The paper low message will occur every 64 lines of print, while the charger message is printed once with continuous alarm activation. Should the local unit go into standby mode when it is already in the front panel mode, the unit will return from standby in the front panel mode.

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NOTES: 1. The remote unit must not be in the power on prompting mode before connecting it to the local unit. The minimum turn-on procedure for the remote 808 is as follows:

A. Install unit and turn power key on.

B. Press CLEAR key once to exit the prompting mode.

C. Turn local unit on and use its REMOTE FUNCTION 1. This procedure will prevent any possible lock-up of unit.

2. After setting the local unit into the front panel mode (with Function 1), the user should wait until the display goes blank before any key sequences are attempted.

3. When using Option 106 at 300 baud (either RS232 or the modem ports), the response to keystrokes is slower than normal operation. Always wait for the LEDs and display prompts before pressing any more keys.

6.3.2 Prompt and Repeat Toggle Functions

When Option 106 is used with other equipment such as a terminal, it will send prompts in [ ] brackets. The full set of prompts reflect the LED prompts of the 808 front panel and are shown in Table 2. Use of REMOTE FUNCTION 40 will toggle these prompts off.

Example: Print out total watts would be:

```
\
[Mode] PR
[YFun] VL
[Unit] WT
[Misc] Chan A, B, C or T?  TO
       7.238KW
```

Use of \ 40 would turn the prompts off and the above example would become:

```
 \PRVLWTTO
T 7.238KW
```

Note that there is no return and line feed on the display. Should the user require the prompt mode again, he would use \ 40 again to toggle the prompts on.

Another toggle function of Option 106 is the repeat read function, REMOTE FUNCTION 46. This function, when on, will send the data being displayed on the remote 808 to the local equipment; Option 106 will continue to send the data until the REMOTE FUNCTION 46 is toggled off. In this way the user may obtain a continuous update on voltage readings, accumulated demand, or any other display of the 808.

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Note these two functions are not intended for use in the front panel mode between the two 808 units.

6.3.3 Character Buffer

The Character Buffer of Option 106 provides storage for all automatic printouts of the remote 808. There are several REMOTE FUNCTIONs which the operator can use to control the buffer. The buffer can be initialized or reset with function 41. The buffer will be completely cleared and ready for use. When ready, the operator can now enable the buffer for storage with function 42. All data will then be stored in the buffer. The user may at any time determine how full the remote buffer is with function 85. Function 85 will send a total count of how many characters out of 8000 have been used. Should the user require that the data be sent, function 43 will cause Option 106 to dump the buffer to the local equipment. Upon completion of the buffer dump, Option 106 will confirm the dump by sending the "Buffer Done" message.

Note: Care should be taken with function 43 since the dump will clear the buffer and disable the storage mode of the buffer. Further buffer storage requires function 42.

If the amount of data to be stored exceeds the 8000 character limit, an overflow condition will occur. If user action is not taken at this time, all subsequent data will be lost. In the overflow condition, all PRINT requests are ignored and any MODE operation of the remote 808 will be followed by the message "Buffer Full". The overflow will also cause a flag to be put in the buffer at the time of the occurrence. When the data is dumped, the data will contain the message "Overflow" at the point where it occurred.

Note: There are some special features of the character buffer that are not controlled by the REMOTE FUNCTIONs. The buffer may also become enabled whenever the communication link to the remote 808 is interrupted. The buffer dump, function 43, may be stopped at any time with either the CLEAR key of the 808, "\" or the escape key. Termination of the dump will occur when Option 106 recognizes and echoes the key. Subsequent buffer dumps will start at the beginning of the last line sent. All characters sent previous to the termination are made available to the buffer for new data. The buffer will also respond to ^S and ^Q inputs (control S and Q), providing Pause/Continue functions and making viewing of up to 14 ft. of printer data to the user.

6.3.4 Raw Data Mode

The Raw data Mode allows the remote 808 to become a transducer for power measurement and management systems. When selected by REMOTE FUNCTION 47, Option 106 will send the raw 808 data. This data consists of the volts, amps, watts and VARs for each of the three channels. Also

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selectable in this mode by toggling function 83 is a running summation of VARH and WH. Function 84 is used to reset or clear these summations to zero. The data is sent in a compressed ASCII data format to minimize transfer time needed. This compressed format is provided with a check sum for validity testing and can be easily decoded by any computer.

NOTE: Raw Data Mode forces three channel output.

String Format:

$ Identifies the start of the raw data string.
N1,N2 Data character count, 2 hexidecimal digits.

D1-D60 Data Characters, as follows:

Chan A	D1-D5	Volts
	D6-D10	Amps
	D11-D15	Watts
	D16-D20	Vars
Chan B	D21-D25	Volts
	D26-D30	Amps
	D31-D35	Watts
	D36-D40	Vars
Chan C	D41-D45	Volts
	D46-D50	Amps
	D51-D55	Watts
	D56-D60	Vars
	D61-D65	Varh
	D66-D70	Wh
	C1,C2	Checksum characters, 2 hexidecimal digits provide binary sum of N1,N2, D1-D60 (D-D70 characters).

Data Format:

D1 positive mantissa = "0,1,2,3,4,5,6,7,8,9"
D1 negative mantissa = "p,q,r,s,t,u,v,w,x,y" (bit 6 set = negative number)

Assumed decimal point between D1 and D2

D2 to D4 fractional portion of mantissa, "0 to 9"

D5 positive exponent = "E+0 to E+14" (Hex $30 to $3E)
D5 negative exponent = "E-1 to E-14" (Hex $70 to $7E)
Note p=-0 is overflow condition

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Examples:

12345 = +1.234 E+5	q234u = -1.234 E-5
6789s = +6.789 E-5	s6789 = -3.678 E+9
9999p = >9.999 E+14	y999p = <-9.999 E+14

Data rate:

One full string every 1.5 sec (1200, 9600 baud). At 300 baud the rate is one string every 3 sec.

Data synchronization:

To synchronize the raw data stream of more than one 808, send \80 or the single character "!" to each unit.

NOTE: If \80 is received during the raw data transmission, data sync does not occur until transmission is complete. Data Sync Begins unconditionally at the time the "!" character is received. Sync time is approximately 2 sec using "!".

Example: The string is typical for raw data output without the summation.

$3C4773271430300231615347732715203007316163477527149030063161738 4

$ starts string.

3C N1,N2 3C=60 decimal characters sent.

47732	D1-D5		4.773×10^{2}V
71430	D6-D10		7.143×10^{0}A
30023	D11-D15	Chan. A	3.002×10^{3}W
16153	D16-D20		1.6153×10^{3}VAR
47732	D21-D25		4.773×10^{2}V
71520	D26-D30		7.152×10^{0}A
30073	D31-D35	Chan. B	3.007×10^{3}W
16163	D36-D40		1.616×10^{3}VAR
47752	D41-D45		4.775×10^{2}V
71490	D46-D50		7.149×10^{0}A
30063	D51-D55	Chan. C	3.006×10^{3}W
16173	D56-D60		1.617×10^{3}VAR

84 C1C2 $C1C2 = \sum ASCII\ (N1,N2,D1-D60)$

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6.3.5 Modem Status

The SETUP printout of the 808 with Option 106 will include information regarding the status of the modem.

The first line on the setup is:

```
Auto Answer On/Off
```

This line indicates the modem mode selected. When "OFF", the dedicated modem (or RS232) is selected and the 808 must be disconnected from the public switched telephone network. The status of this line is either controlled by the program plug installed on J5 or by use of REMOTE FUNCTIONS 64 or 65. Function 64 turns Auto Answer on while 65 turns it off. When using either of these functions, disconnect the modem from the phone line.

The next line of the SETUP printout will be the phone number dialing modes. The user may enter up to 16 digits using the "." for the optional pause (REMOTE FUNCTION 62). The SETUP printout will look like:

```
Phone Number
p123p456p7890
```

where the "p" in the printout indicates a user entered pause. If a phone number has not been entered, the SETUP printout will not print the above mentioned lines.

REMOTE FUNCTION 63 controls the next set of lines on the SETUP printout.

```
Auto Dial Time
XX:XX:XX
XX:XX:XX
XX:XX:XX
```

Where XX:XX:XX is the time when the Auto Dial starts. If no auto-dial times have been entered, only the "Auto Dial Time" will be printed.

The last line on the SETUP printout will be

```
Buf Full Dial    On/Off
```

REMOTE FUNCTION 66 will turn it "ON" while function 67 turns it "OFF". This function will cause the auto-dial sequence to occur should the character buffer become full.

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7 FACTORY REPAIR

When factory repair is desired, proceed as follows:

1) Contact the Dranetz Service Corporation and obtain an authorization number.

Tel: (201) 287-2535; TWX 710-997-9553;

Telex: 499-7808; Cable: DRANETZ

2) Fill out the Repair/Service Order form enclosed in the Volume 1 Series 808 manual and ship it with the equipment to the Dranetz Service Corporation.

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APPENDIX

Special notes on auto answer mode.

If after dialing the entered phone number, the 808 does not detect an answer tone after 15 seconds, it will hang up (on hook). Automatic dialing functions will try dialing again after a 5-minute wait. This cycle will repeat five times. If all five auto dials are unsuccessful, the 808 will stop any further auto dial attempts.

Auto dialing is also stopped after any unsuccessful manual dial (function 61).

Auto dialing is re-enabled after the 808 successfully answers an incoming call or successfully dials.

NOTE: A successful answer means that the 808 detected a valid ring signal and a carrier within 15 seconds of going off hook. See auto answer spec and auto answer sequence.

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Instructions for Connecting the 646/808 Rack-Mount Adapter

Required Materials

(1) Right-Hand Support Bracket (P/N 111376-G1)
(1) Left-Hand Support Bracket (P/N 111376-G2)
(1) Front Panel (P/N 111377)
(1) Unit Support (P/N 111378)
(6) Color Keyed Screws (P/N 104925-G1)
(4) #6-32 x ¼-inch long screws

Assembly Instructions

Note: Refer to the illustration on the back of this page for the assembly locations as you follow the steps for putting together the rack-mount adapter.

1) Lay the unit support (P/N 111378) on a flat surface with its edges pointing down and its rectangular slot facing forward.

2) Attach the front panel (P/N 111377) to the unit support with its painted side facing forward. Use 2 of the color keyed screws to secure the front panel to the unit support.

3) As you are facing the rack-mount adapter, attach the right-hand side support bracket (P/N 111376-G1) to the back of the front panel using 2 of the color keyed screws (the bent edge should be facing inward). Secure the side of the support bracket to the to the unit support using 2 of the ¼-inch screws.

4) Attach the left-hand side support bracket (P/N 111376-G2) to the back of the front panel using 2 of the color keyed screws (the bent edge should be facing inward). Secure the side of the support bracket to the to the unit support using 2 of the ¼-inch screws. This completes rack-mount adapter assembly.

5) Lay your 646 or 808 unit on its rear panel so that its front panel faces up; remove the unit's 4 rubber feet from its bottom panel.

6) Place the rack-mount adapter over the 646 or 808 so that the unit's front panel fits into the cut-out portion of the adapter's front panel.

7) Secure the unit to the adapter by reattaching the 4 feet and their screws through the unit support's screw holes.

8) The rack-mount adapter containing your unit can now be attached to any 19-inch rack-mount by positioning the adapter into place and securing it to the front of the rack-mount through its 4 slots (1 in each corner).

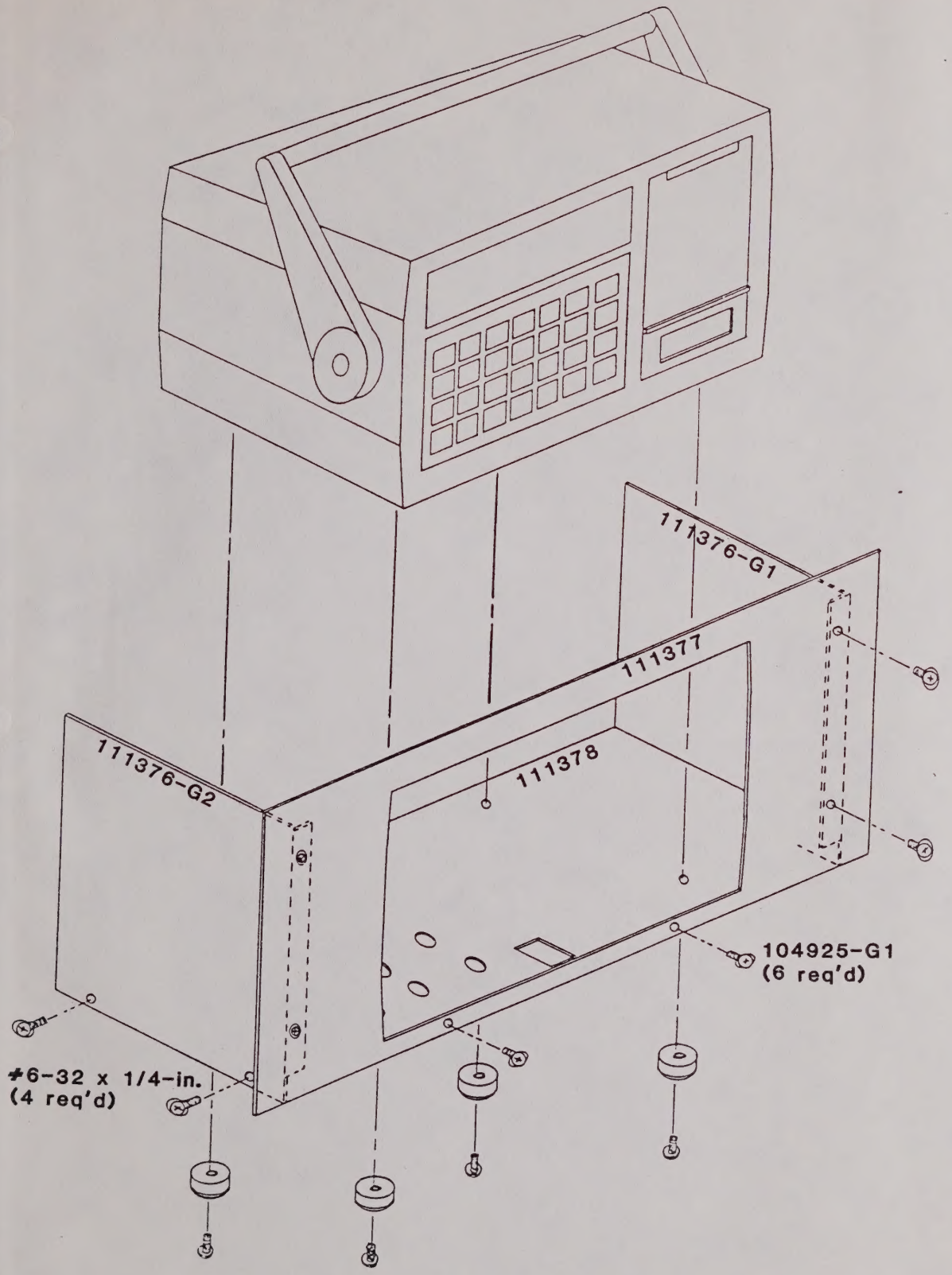

Fig 1. 646/808 Rack-Mount Adapter Assembly